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**BACKGROUND OF THE INVENTION**

**1. The Field of the Invention**

The present invention relates to customization of documents for particular clients based on attributes of the clients. More specifically, the present invention relates to server-side scripting in which the decision process regarding how customized content is selected is removed from a server application and is implemented by a decision engine.

**2. The Prior State of the Art**

As the Internet becomes more accessible and as more information is provided to users on the Internet, the need for customizing information for particular uses has become more critical. Users can retrieve substantially any type of educational, news, entertainment, and general reference information from the Internet, and particularly from the World Wide Web. There is often a need for customizing information for particular users based on any number of criteria, including language, country, client computer hardware, software, and display device properties, level of subscription that the user may have subscribed to, and user profiles, such as age, interest, etc.

Customization of information for users can be performed by Web servers associated with individual Web sites including, for example, Internet portals, search engines, news services, financial sites, and the like. Customization of information can also be performed by servers associated with subscription based information services. Examples of such subscription based information services include value-added "members only" access to information by Internet service providers and intranets. In any of the foregoing examples, customization of information is performed by a server in response to a request by a client for a Web page or another document.

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The foregoing approaches for customization can be adequate in situations where the decision criteria are relatively simple or in which content is selected based on only one or two client attributes. If a new content file representing a different language and country were to be added in a system using conventional customization techniques, the source code or scripts executed by the server application must be altered to provide access to the new content. In situations where scalability or frequent changes in decision criteria are important or in which content is to be selected based on multiple criteria, conventional customization systems become unmanageable. For instance, multiple portions of the source code or script may need to be individually edited for customization to be adequately performed, which can lead to significant administrator resources being required or the risk of bugs being introduced into the code. In the coming years it is expected that customization of information based on larger number of client attributes and decision criteria will be required in many situations, making the need for extensible customization methods and systems even more important.

## SUMMARY OF THE INVENTION

The present invention relates to server-side scripting executed by a server application to create customized documents for clients. The process of selecting the customized content is abstracted from the script and the server application and is implemented by a decision engine that is accessed by the server application. In this manner, new content can be easily added and the decision criteria can be conveniently modified without the need for changing the source code of the server application or the scripts executed by the server application.

There are two basic phases in the process of creating a customized document, namely, assembling the script that is designed to create the document and then executing the script. Assembling the script begins as a client issues a request to the server for the document. The server application receives the request and begins assembling a script that is associated with the requested document. The server application issues a request to the decision engine to resolve which content files contain content that is appropriate for the client.

The server application then encounters a Call statement in the script that causes the server application to issue a request for a particular template in one of the content files that includes customized content or additional instructions for selecting the customized content. The template includes a portion of script that is effectively concatenated with the original script, resulting in the script being supplemented and assembled at runtime. Additional requests for other templates can be performed based on the instructions included in the original script or the templates that have been added to the original script during runtime. Once all the required content files have been resolved and the script has been assembled, the script is executed to create the document for the client.



Additional features and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by the practice of the invention. The features and advantages of the invention may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. These and other features of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

In order that the manner in which the above-recited and other advantages and features of the invention are obtained, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings. Understanding that these drawing depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

Figure 1 illustrates an exemplary system that provides a suitable operating environment for the present invention.

Figure 2 is a block diagram illustrating an exemplary network in which the invention can be implemented.

Figure 3 depicts selected components of a server, including a server application, a decision engine, content files, and attribute providers, for customizing a document for a client.

Figure 4 graphically illustrates one example of a script that is assembled at runtime by adding request functionality and content to an original script in response to decisions made by the decision engine.

Figure 5 represents a customized document that has been created according to a specific example disclosed herein.

Figure 6 is a flow diagram illustrating a method for assembling a server-side script to create a customized document according to one embodiment of the invention.



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1 special purpose computer, or special purpose processing device to perform a certain  
2 function or group of functions.

3 Figure 1 and the following discussion are intended to provide a brief, general  
4 description of a suitable computing environment in which the invention may be  
5 implemented. Although not required, the invention will be described in the general context  
6 of computer-executable instructions, such as program modules, being executed by  
7 computers in network environments. Generally, program modules include routines,  
8 programs, objects, components, data structures, etc. that perform particular tasks or  
9 implement particular abstract data types. Computer-executable instructions, associated  
10 data structures, and program modules represent examples of the program code means for  
11 executing steps of the methods disclosed herein. The particular sequence of such  
12 executable instructions or associated data structures represent examples of corresponding  
13 acts for implementing the functions described in such steps.

14 Those skilled in the art will appreciate that the invention may be practiced in  
15 network computing environments with many types of computer system configurations,  
16 including personal computers, hand-held devices, multi-processor systems,  
17 microprocessor-based or programmable consumer electronics, network PCs,  
18 minicomputers, mainframe computers, and the like. The invention may also be practiced  
19 in distributed computing environments where tasks are performed by local and remote  
20 processing devices that are linked (either by hardwired links, wireless links, or by a  
21 combination of hardwired or wireless links) through a communications network. In a  
22 distributed computing environment, program modules may be located in both local and  
23 remote memory storage devices.

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1 With reference to Figure 1, an exemplary system for implementing the invention  
2 includes a general purpose computing device in the form of a conventional computer 20,  
3 including a processing unit 21, a system memory 22, and a system bus 23 that couples  
4 various system components including the system memory 22 to the processing unit 21.  
5 The system bus 23 may be any of several types of bus structures including a memory bus  
6 or memory controller, a peripheral bus, and a local bus using any of a variety of bus  
7 architectures. The system memory includes read only memory (ROM) 24 and random  
8 access memory (RAM) 25. A basic input/output system (BIOS) 26, containing the basic  
9 routines that help transfer information between elements within the computer 20, such as  
10 during start-up, may be stored in ROM 24.

11 The computer 20 may also include a magnetic hard disk drive 27 for reading from  
12 and writing to a magnetic hard disk 39, a magnetic disk drive 28 for reading from or  
13 writing to a removable magnetic disk 29, and an optical disk drive 30 for reading from or  
14 writing to removable optical disk 31 such as a CD-ROM or other optical media. The  
15 magnetic hard disk drive 27, magnetic disk drive 28, and optical disk drive 30 are  
16 connected to the system bus 23 by a hard disk drive interface 32, a magnetic disk drive-  
17 interface 33, and an optical drive interface 34, respectively. The drives and their  
18 associated computer-readable media provide nonvolatile storage of computer-executable  
19 instructions, data structures, program modules and other data for the computer 20.  
20 Although the exemplary environment described herein employs a magnetic hard disk 39, a  
21 removable magnetic disk 29 and a removable optical disk 31, other types of computer  
22 readable media for storing data can be used, including magnetic cassettes, flash memory  
23 cards, digital video disks, Bernoulli cartridges, RAMs, ROMs, and the like.

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Figure 3 illustrates the interaction between the client and a server as a document is customized for the client according to one embodiment of the invention. The customization process begins as client 100 transmits a uniform resource identifier (URI) that represents that request for the document to Internet 110 and server 140 as shown in Figure 3 at arrow 142. Server application 144 operating at server 140 recognizes the request for the document and begins assembling a script 146 that is associated with the particular document requested by client 100. In environments in which server 140 can generate a plurality of different web pages, server application 144 has access to a plurality of scripts 146, each being adapted to generate a particular document.

(In one embodiment, decision engine 148 is one that has been disclosed in U.S. Patent Application Serial No. \_\_\_\_/\_\_\_\_, entitled "Selecting Attribute Based Content for Server Applications," which was filed on the same day as the present application and is incorporated herein by reference. As described in the foregoing patent

As shown on Figure 3, decision engine 148 can identify values of attributes or properties associated with clients 100 by referring to attribute providers 152, which are any software module, database, or other source of information specifying the values of such attributes or properties. In this manner, the developers or site administrators writing scripts 146 do not need to be concerned with identifying the values of the attributes associated with clients 100 or with providing these values to decision engine 148. Further details regarding decision engine 148, content files 150, and attribute providers 152 according to one embodiment of the invention are disclosed in U. S. Patent Application Serial No. \_\_\_\_\_/\_\_\_\_\_ entitled "Selecting Attribute Based Content for Server Applications," which has been incorporated herein by reference.























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1 <% template AffinityImage %>

2 **Human Fund [Image]**

3 <% end-template %>

4 In this example, decision engine 148 returns to server application 144 a  
5 supplemental portion of script that has been found to correspond to "TVServiceImage" in  
6 the specified image content file 150c, which is a portion of the file Images.jnx:

7  
8 **Supplemental Script C**

9 <% resolve subscription %>

10 <% template TVServiceImage %>

11 <% call SubscriptionImage %>

12 <% end-template %>

13 The foregoing supplemental script B includes a "resolve" statement that results in  
14 decision engine 148 further resolving a "subscription" content file among a plurality of  
15 available subscription content files that is designated as appropriate for client 100. In this  
16 example, the appropriate "subscription" content file 150n is selected based on a client  
17 attribute indicating an enhanced television service to which the client is subscribed. In this  
18 example, a client profile associated that is associated with client 100 and which is  
19 accessible to an attribute provider 152 specifies that the client is subscribed to "FooTV",  
20 and the decision engine resolves an associated subscription content file. It is noted that the  
21 "template TVServerImage" includes the Call statement, "call SubscriptionImage", which  
22 corresponds to the request element 174 of Figure 4.











application encounters the “Resolve” statement in the script and the method advances to act 196.

In act 196, and in response to the Resolve statement, the server application issues a request to the decision engine to resolve, or identify, content files 150 of Figure 3 that are appropriate for client 100 based on whatever criteria are designated at decision engine 148.

In act 198, the contents of the resolved file are concatenated with the original script, such that the original script is assembled at runtime. In act 200, the resolved file is added to the list of files that remain to be processed. In this manner, any additional "Resolve" statements or other statements that require the decision engine to perform decisions can be processed during the assembly of the script. So long as there remain unprocessed files and unprocessed resolve statements, the method returns to acts 196, 198, and 200 until the content files have been resolved and the portions of script contained in the content files are concatenated with the original script. Based on the contents of the original script, the content files, and the decision criteria employed by the decision engine, decision blocks 192 and 194 and acts 196, 198, and 200 result in the creation, at runtime, of a script that is adapted specifically to generate a document that is customized for the particular client and user to which it will be transmitted. At act 202, the assembled script is executed so as to generate the code, such as HTML code, that is to be transmitted to the client.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is,